NORMA SOSIOMATEMATIK: HUBUNGAN ANTARA INTERAKSI SOSIAL MAHASISWA DAN HASIL BELAJAR MATEMATIKA

SOCIOMATEMATIC NORMS: THE RELATIONSHIP BETWEEN STUDENT SOCIAL INTERACTIONS AND MATHEMATICS LEARNING OUTCOMES

Mohammad Archi Maulyda^{1*}, Dyah Indraswati², Setiani Novitasari³, Deni Sutisna⁴, Ida Ermiana⁵

¹²³⁴⁵ Prodi PGSD, FKIP, Universitas Mataram, JL. Majapahit, No.22, Gomong, Mataram, NTB,

*E-mail: archimaulyda@unram.ac.id

Hp: 08154192370

ABSTRAK

Interaksi sosial yang terjadi antar individu di dalam matematika disebut sosiomatematik. Norma Sosiomatematik merupakan aturan-aturan yang berasal dari nilai-nilai matematika yang dibawa ke dalam konteks sosial. Norma sosiomatematik dipandang mampu meningkatkan pemahaman peserta didik. Fokus utama dalam penelitian ini adalah, (1) Menganalisa konten sosial pada mata kuliah Pembelajaran Matematika SD; (2) Memaparkan proses interaksi sosial pada subjek penelitian; dan (3) Mendeskripsikan hubungan antara interaksi sosial dan hasil belajar matematika. Jenis penelitian ini adalah kuantitatif dengan pendekatan deskriptif. Penelitian dilaksanakan pada tanggal 15 September 2020 kepada 100 mahasiswa PGSD sebagai subjek penelitian. Pemilihan subjek penelitian ini didasarkan pada mahasiswa yang telah menyelesaikan mata kuliah pembelajaran matematika SD, karena data hasil UAS mata kuliah ini akan dijadikan data primer dalam analisis data selanjutnya. Teknik pengumpulan data menggunakan metode survey dan analisis hasil UAS matematika mahasiswa. Analisis data menggunakan analisis regresi linier sederhana. Dari penelitian, diperoleh hasil: (1) Konten matematika dalam proses perkuliahan sudah dimunculkan oleh dosen. Sistem perkuliahan yang berbentuk diskusi kelompok dapat meningkatkan kemampuan komunikasi, keberanian dan kerjasama yang dimiliki mahasiswa. (2) Gambaran interaksi sosial mahasiswa dapat dimodelkan. Model interaksi sosial menunjukkan interaksi sosial dapat berbentuk asosiatif dan disosiatif. (3) Ada hubungan antara interaksi sosial dengan hasil belajar matematika. Hubungan tersebut cukup kuat, dan interaksi sosial berpengaruh terhadap hasil belajar matematika mahasiswa.

Kata kunci: *hasil belajar, interaksi sosial, matematika, sosiomatematika*

ABSTRACT

The social interactions that occur between individuals in mathematics are called sociomatematics. Sociomatematic norms are rules derived from mathematical values that are brought into a social context. Sociomatematic norms are seen as being able to improve students' understanding. The main focus of this research are, (1) Analyzing social content in Elementary School Mathematics Learning courses; (2) Describing the social interaction process on the research subject; and (3) to describe the relationship between social interactions and mathematics learning outcomes. This type of research is quantitative with a descriptive approach. The research was conducted on 15 September 2020 with 100 PGSD students as research subjects. The selection of research subjects was based on students who had completed elementary mathematics learning courses, because the UAS result data from this course would

be used as primary data in further data analysis. The data collection technique used a survey method and the analysis of the results of the student mathematics examination. Data analysis used simple linear regression analysis. From the research, the results obtained: (1) Mathematical content in the lecture process has been raised by the lecturer. The lecture system in the form of group discussions can improve students' communication skills, courage and cooperation. (2) An overview of student social interactions can be modeled. The social interaction model shows that social interaction can take the form of associative and dissociative. (3) There is a relationship between social interaction and mathematics learning outcomes. This relationship is quite strong, and social interactions have an effect on student mathematics learning outcomes..

Keywords: *learning outcomes, social interaction, mathematics, sociomatematics*

1. PENDAHULUAN

Lecture activity is one of the activities to shape human character who is pursuing levels in tertiary institutions [1]. Someone who is educated at a tertiary level is already at the stage of child development according to Piaget, where the environment is a key factor in the formation of human character [2]. Therefore, educational activities in higher education cannot be separated from aspects of social interaction between students.

According to Maulyda et al. [3] education itself aims to form individuals who are capable of community and useful both for themselves and for others. In relation to mathematics education, the objectives of mathematics education are (1) an emphasis on the ability to arrange students' reasoning and personality (formal goals); and (2) emphasis on the application of mathematics both in mathematics and outside mathematics (material goals) [4]. These two goals should be realized in a balanced way. The fact is that material goals related to individual mathematical abilities are more emphasized than formal goals. Lecturers or teachers as educators more often focus on student achievement in solving math problems. Whereas the ability to socialize that is related to formal goals is an important aspect that must be possessed by individuals in the millennial era now [5]. Seeing the importance of positioning mathematics in social interactions, Gorgorió & Planas [6] formulated 4 mathematical education objectives namely, (1) practical goals; (2) civic goal; (3) professional goals; and (4) cultural goals. These goals are related to the ability of individuals to solve problems and the ability of individual social interactions.

Social interactions that occur between individuals are often referred to as social norms. Social norms in mathematics learning are often known as sociomatematics/sociomathematics [6;7]. Sociomatematic Norms are rules derived from mathematical values brought into the social context. According to Kang et al. [9], the development of sociomathematic norms can improve students' understanding because the classroom conditions are comfortable and conducive to the learning process.

Some of the results of previous studies indicate that sociomathematics skills can improve student collaboration skills [9;10]. Furthermore, according to Arda [12] cooperation is one of the important stages in solving mathematical problems. So, it can be concluded that the sociomathematics abilities of students can correlate with students' skills in solving math problems. Moving deeper from the results of previous studies, the position of this research is to explore the relationship between sociomathematics abilities and mathematics learning outcomes. Previous studies have been carried out separately, so that they cannot provide a definite picture of the relationship between sociomathematics and mathematics learning outcomes.

Related to the importance of the development of Sociomatematic norms in the educational process, researchers are interested in studying the development of Sociomatematic norm values among students. The researcher hopes that the results of the study can provide an overview and related insights about Sociomatematic values for education practitioners, especially at the tertiary level.

2. RESEARCH METHOD

This type of research is quantitative with a descriptive approach [13]. To get the data needed, researchers distributed surveys to 100 students from the University of Mataram's PGSD Study Program who were randomly selected to be subjects in the study. To simplify the data collection process, researchers used Googleform's platform which was already available on the Google search engine. The results of quantitative google form data have been tabulated so that the data can be directly analyzed descriptively by researchers.

The main focus in this research is, (1) Analyzing social content in elementary mathematics learning courses; (2) Describe the process of social interaction of research subjects, and (3) describe the relationship between social interaction and mathematics learning outcomes.

To obtain valid data related to the relationship between social interaction and mathematics learning outcomes, researchers conducted a simple linear regression analysis [14]. Previously the data will be tested for normality and linearity. After the data is proven to be normal and linear, the researcher will conduct a correlation test to see if there is a relationship between social interaction and mathematics learning outcomes. Mathematics learning outcome data obtained from the UAS value of learning subjects of students who were respondents in the survey.

3. RESULT & DISCUSSION

Social Content in Mathematics Learning Courses

In elementary mathematics learning courses, lecturers have implemented several social aspects in lectures. According to Jeannotte & Kieran [15] social aspects of classroom learning are,

(1) Collaboration through group discussions; (2) Dare to express ideas through presentations in front of the class; and (3) The ability to communicate with others through discussion and question and answer.

Based on observations and brief interviews, it shows that social content in mathematics lectures has been going well. Students are active in group discussions, so that shows the ability of cooperation and communication of research subjects is good [16]. When students present the results of their discussion, it appears that students have the courage to communicate what they want to explain. The following classroom layout design is applied in class to strengthen the social aspects of learning mathematics in class.

Figure 1. Classroom layout design

Figure 1 shows the classroom layout design during lectures. The lecture design shows that in 1 class there are 2 lecturers who teach (team teaching). The arrows in Figure 1 also show that groups 1 and 3 face each other in groups 2 and 4. This group design can evoke activeness in group discussions because a sense of competition in the class can be raised. So that communication will be established as the embryo of social interaction between students, both internal communication within the group and interactions outside the group. According to Maulyda et al. [17]

the design of learning groups in the learning process greatly influences the activeness of group discussion in the classroom.

One proof of the emergence of social content in elementary mathematics learning is also seen in elementary mathematics learning textbooks discussed during the lecture process. Many math problems that appear in textbooks are made contextually so that there are many social elements in the problems discussed in lectures in class. Especially at the thematic level of basic education, social themes will certainly emerge in the learning process [18]. Thus, it is important for prospective teachers in this case students can link social aspects in learning, including in learning mathematics.

Overview of Student Social Interaction

Based on the results of a survey conducted with 100 students as respondents, researchers made social interactions. The model of social interaction created is between student and student. The social interaction model between students and students is described as follows:

Figure 2. Models of student social interaction with students

Figure 2 shows that the process of interaction between students begins with ideas. Then the process continues on the verbal communication patterns of each student. This stage of verbal communication distinguishes social interaction between student A and student B or students from one another. After that, there will be an admission process from student B. This process can then result in the form of associative or dissociative. If the results of the processing are associative, the social interactions that will be formed are cooperation, assimilation, accommodation, and acculturation [19]. However, if the results of the processing are dissociative, then the form of social interaction is competition, convention, and conflict [9].

Based on the explanation, one of the key factors in the process of interaction between students is communication skills, especially verbal communication. According to Morgan [20], verbal communication is one of the main tools for an individual to be able to form relationships and socialize with other individuals.

Relationship of Social Interaction with Mathematics Learning Outcomes

To see with certainty whether there is an association between students' social interactions and mathematics learning outcomes, the researchers conducted a simple linear regression test. The data offered are the results of a survey given a score in the range 1-4. While the data of mathematics learning outcomes in UAS subjects in the previous semester's elementary mathematics subjects Before conducting a regression test using SPSS software, researchers first estimate the value in order to reach the same scale of 1-100 (equating to the value of the best mathematics learning outcomes). The

following results of the regression test and its interpretation;

Correlations			
		Nilai	Interaksi_Sosial
Pearson Correlation	Nilai	1.000	.526
	Interaksi_Sosial	.526	1.000
Sig. (1-tailed)	Nilai	.	.000
	Interaksi_Sosial	.000	.
N	Nilai	100	100
	Interaksi_Sosial	100	100

Figure 3. The results of the analysis of the relationship between the two variables

Figure 3 shows the results of the correlation of regression tests using SPSS. It can be seen that the Sig- (1-tailed) value of the data is 0,000. Because of the value > 0.05, it can be concluded that there is a relationship between social interaction and student mathematics learning outcomes. To see how strong the connection is we can see Figure 4 below.

Model Summary ^a							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.526 ^a	.276	.269	7.24358	.276	37.393	1

a. Predictors: (Constant), Interaksi_Sosial

b. Dependent Variable: Nilai

Figure 4. The results of the data are not a strong relationship between the two variables

Figure 4 shows that the R-value in the Model Summary^b table is 0.526. This value indicates that the relationship between social interaction and student mathematics learning outcomes is quite strong. Furthermore, the Anovab results in Figure 5 below can indicate the effect or absence of influence between the two variables.

ANOVA ^b					
Model		Sum of Squares	df	Mean Square	Sig.
1	Regression	1961.988	1	1961.988	37.393
	Residual	5142.012	98	52.470	.000 ^a
	Total	7104.000	99		

a. Predictors: (Constant), Interaksi_Sosial

b. Dependent Variable: Nilai

Figure 5. Results of influence data between 2 variables

Figure 5 shows that the significant value in the Anova table is 0,000. because the value > 0.05, it is said that there is an influence between social interaction and mathematics learning outcomes.

Based on the explanation above, it can be seen that between social interaction and student mathematics learning outcomes have a relationship. The relationship between these two things is quite strong. The above results also show that the social interactions that students have can affect their mathematics learning outcomes. Thus, the lecturer must also pay attention to the social interactions of students in the lecture process so that the objectives of the lecture can be achieved and the information that is trying to be transferred to students becomes more maximal.

4. CONCLUSION

Based on the results of research and discussion it can be concluded that (1) Mathematical content in the lecture process has been tried to be raised by lecturers. The lecture system that makes discussion groups can improve communication skills, and institutions that support membership. This will impact the ability of students to support society among students. (2) Furthermore, the description of social interaction can be modeled. Social interaction models show that social

interaction can be associative and dissociative. (3) Finally, the results of the study also show that there is a relationship between social interaction and mathematics learning outcomes. The relationship is quite strong and social interaction can affect student mathematics learning outcomes.

5. SUGGESTION

Research suggestions are addressed to lecturers who support courses, lecturers should pay attention to the lecture system that can stimulate the emergence of social interactions that occur between students. For further research, deepening can be carried out in aspects of social interaction to other more recent aspects, such as 21st-century thought processes or digital literacy. This needs to be done so that the horizons of studies related to social interaction can be richer and become additional insights for the general public, especially for education practitioners such as teachers and lecturers.

6. REFERENCES

- [1] V. R. Hidayati, M. A. Maulyda, G. Gunawan, A. N. Rahmatih, and M. Erfan, "System of Linear Equation Problem Solving: Descriptive-Study about Students' Mathematical Connection Ability," *J. Phys. Conf. Ser.*, vol. 1594, p. 012042, 2020, doi: 10.1088/1742-6596/1594/1/012042.
- [2] R. Y. Tyaningsih, Baidowi, and M. A. Maulyda, "Integration of Character Education in Basic Mathematics Learning in the Digital Age," *Atl. Press*, vol. 465, no. Access 2019, pp. 156-160, 2020.
- [3] M. A. Maulyda, Umar, Asrin, V. R. Hidayati, and A. K. Rosyidah, "The Influence Of Gender And Auditory Intellectually Repetition (Air) Learning Model On Student Learning Outcomes," *J. Karya Pendidik.*, vol. 7, no. 1, pp. 21-24, 2020, [Online]. Available: <https://jurnal.unimus.ac.id/index.php/JPMat/article/view/5897/pdf>.
- [4] S. Istiningsih, F. P. Astria, B. N. Khair, L. F. Haryati, and M. A. Maulyda, "Pelaksanaan Perkuliahan Pengajaran Mikro Di Program Studi Pgsd: Sebuah Penelitian Evaluasi," *Perspekt. Ilmu Pendidik.*, vol. 34, no. 2, pp. 93-100, 2020, doi: 10.21009/pip.342.3.
- [5] L. Cragg and C. Gilmore, "Skills underlying mathematics: The role of executive function in the development of mathematics proficiency," *Trends in Neuroscience and Education*. National Chamber Foundation, London, 2014, doi: 10.1016/j.tine.2013.12.001.
- [6] P. J. Klosterman, "Identification and establishment of social and sociomathematical norms associated with mathematically productive discourse," 2017.
- [7] S. A. Widodo and A. S. Purnami, "Mengembangkan Norma Sosiomatematik Dengan Team Accelerated Instruction," *Numer. J. Mat. dan Pendidik. Mat.*, vol. 2, no. 1, p. 29, 2018, doi: 10.25217/numerical.v2i1.238.
- [8] K. Tatsis, "Factors Affecting the Establishment of Social and Sociomathematical Norms," *J. Math. Educ.*, vol. 23, no. 2, pp. 12-20, 2018.
- [9] S. M. Kang and M. K. Kim, "Sociomathematical norms and

- the teacher's mathematical belief: A case study from a Korean in-service elementary teacher," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 12, no. 10, pp. 2733-2751, 2016, doi: 10.12973/eurasia.2016.1308a.
- [10] M. Muhaimin, K. Kartono, and B. Astuti, "An Analysis of Sociomathematical Norms of Elementary School Students Through Collaborative Problem Solving Learning," *J. Prim. Educ.*, vol. 12, no. 3, pp. 677-687, 2019.
- [11] S. A. Widodo, Turmudi, J. A. Dahlan, E. Harini, and F. Sulistyowati, "Confirmatory factor analysis sosiomathematics norm among junior high school student," *Int. J. Eval. Res. Educ.*, vol. 8, no. 2, pp. 123-134, 2020, doi: 10.11591/ijere.v9i2.20445.
- [12] O. A. Cimen, "Discussing Ethnomathematics: Is Mathematics Culturally Dependent?," *Procedia - Soc. Behav. Sci.*, vol. 564, no. Maret, pp. 344-356, 2014, doi: 10.1016/j.sbspro.2014.09.215.
- [13] J. W. Creswell, *Research Design: Qualitative, Quantitative and Mixed Methods Approaches (4th ed.)*. Thousand Oaks, CA: SAGE, 2014.
- [14] R. Heale and A. Twycross, *Validity and reliability in quantitative studies*, 3rd ed. Philadelphia: Focus on ExCale, 2015.
- [15] D. Jeannotte and C. Kieran, "A conceptual model of mathematical reasoning for school mathematics," *Educ. Stud. Math.*, vol. 35, no. 4, pp. 235-267, 2017, doi: 10.1007/s10649-017-9761-8.
- [16] K. Komatsu, "A framework for proofs and refutations in school mathematics: Increasing content by deductive guessing," *Educ. Stud. Math.*, 2016, doi: 10.1007/s10649-015-9677-0.
- [17] M. A. Maulyda, A. N. Rahmatih, Gunawan, V. R. Hidayati, and M. Erfan, "Retroactive Thinking Interference of Grade VI Students : A Study on the Topics of PISA Literacy Lessons Retroactive Thinking Interference of Grade VI Students : A Study on the Topics of PISA Literacy Lessons," *J. Phys. Conf. Ser.*, vol. 1471, no. Maret, pp. 1-7, 2020, doi: 10.1088/1742-6596/1471/1/012037.
- [18] C. Salavera, P. Usán, and P. Teruel, "The relationship of internalizing problems with emotional intelligence and social skills in secondary education students: gender differences," *Psicol. Reflex. e Crit.*, vol. 32, no. 4, pp. 1-9, 2019, doi: 10.1186/s41155-018-0115-y.
- [19] W.-H. Tsai, "Interactions Between Teaching Norms of Teacher'S Professional Community and Learning Norms of Classroom Communities," in *Proceedings of the 31 Conference of the International Group for the Psychology of Mathematics Education*, 2007, vol. 4, pp. 217-224.
- [20] T. Gaspar, A. Cerqueira, C. Branquinho, and M. G. Matos, "The Effect of a Social-Emotional School-Based Intervention upon Social and Personal Skills in Children and Adolescents," *J. Educ. Learn.*, vol. 7, no. 6, pp. 57-66, 2018, doi: 10.5539/jel.v7n6p57.